Supplemental Material

Manuscript Title: Birth Weight Following Pregnancy During the 2003 Southern

California Wildfires

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Contents for Supplementary Material

Modeling Seasonality with a Cosinor

Under the cosinor-based approach, the temporal term $f(t_i)$ is constructed from a modified

cosine function having phase P, frequency ω, and amplitude A:

$$f(t_i) = \alpha_0 t_i + A\cos(\omega t_i - P) \qquad \text{[S1]}$$

The additive term $\alpha_0 t_i$ models the secular trend, since t_i represents the LMP for birth i.

The frequency ω is chosen according to the length of the modeled cycle; in this case, we

are interested in modeling an annual cycle, so $\omega \approx 2\pi / 365.14$ days^{-1}. The following

expression is equivalent to Eq (1), but is linear in t_i, and so can be fit using standard

techniques such as least squares:

$$f(t_i) = \alpha_0 t_i + c\cos(\omega t_i) + s\sin(\omega t_i) \qquad \text{[S2]}$$

In terms of the coefficients c and s, the amplitude A then corresponds to:

$$A = \sqrt{c^2 + s^2} \qquad \text{[S3]}$$

While the phase P (in radians) corresponds to:

$$P = \begin{cases} \arctan(s/c), & c \geq 0 \\ \arctan(s/c) + \pi, & c < 0,\ s \geq 0 \\ \arctan(s/c) - \pi, & c < 0,\ s < 0 \end{cases} \qquad \text{[S4]}$$

Supplemental Material, Table S1. Linear model results for birth weight, in grams, showing effect estimates for all covariates, exposed during any trimester, and each trimester individually vs. all trimesters outside fire period.

	exposure in any trimester vs. all trimesters outside fire period		exposure in each trimester vs. all trimesters outside fire period	
	Effect estimate (change, in g)	95% CI	Effect estimate (change, in g)	95% CI
Exposure				
All trimesters outside fire period	(ref)		(ref)	
Fire period during any trimester	-6.1	(-8.7, -3.5)		
Fire period during first trimester			-3.3	(-7.2, 0.6)
Fire period during second trimester			-9.7	(-14.5, -4.8)
Fire period during third trimester			-7.0	(-11.8, -2.2)
Fetal sex				
Male	(ref)		(ref)	
Female	-119.0	(-120.8, -117.1)	-119.0	(-120.8, -117.1)
Gestational age, weeks				
37	(ref)		(ref)	
38	143.3	(138.2, 148.4)	143.3	(138.2, 148.4)
39	273.3	(268.7, 278.0)	273.4	(268.7, 278.0)
40	368.9	(364.3, 373.5)	368.9	(364.3, 373.5)
41	441.9	(437.3, 446.6)	441.9	(437.3, 446.6)
42	460.0	(454.8, 465.3)	460.0	(454.8, 465.3)
Parity				
1	(ref)		(ref)	
2	90.5	(88.3, 92.8)	90.5	(88.3, 92.8)
3 or more	131.7	(129.3, 134.2)	131.7	(129.3, 134.2)
Maternal age, years				
Less than 18	(ref)		(ref)	
18 to 34	46.4	(40.7, 52.0)	46.4	(40.7, 52.0)
35 to 50	71.8	(65.6, 77.9)	71.8	(65.6, 77.9)
Maternal education				
Less than high school	-19.3	(-21.9, -16.8)	-19.3	(-21.9, -16.8)
Completed h.s. or equivalent	(ref)		(ref)	
1 to 3 years postsecondary	23.6	(20.8, 26.5)	23.6	(20.8, 26.4)
4 or more years postsecondary	35.3	(32.3, 38.3)	35.3	(32.3, 38.3)
Maternal race/ethnicity				
Hispanic	-42.0	(-44.7, -39.3)	-42.0	(-44.7, -39.3)
Non-Hispanic White	(ref)		(ref)	
Non-Hispanic Black	-175.9	(-179.3, -172.5)	-175.9	(-179.3, -172.5)
Non-Hispanic Asian	-166.8	(-171.2, -162.4)	-166.8	(-171.2, -162.4)
Non-Hispanic Multi/Other/Unknown	-31.2	(-47.9, -14.5)	-31.2	(-47.9, -14.5)
Season conceived				
January - March	(ref)		(ref)	
April - June	3.4	(0.7, 6.1)	3.9	(1.0, 6.8)
July - September	12.5	(9.8, 15.2)	11.9	(9.0, 14.7)
October - December	3.1	(0.5, 5.7)	2.7	(0.0, 5.4)
Linear time trend				
Per year	-6.9	(-7.6, -6.2)	-6.9	(-7.6, -6.2)

Supplemental Material, Table S2. Linear model results for birth weight, in grams, showing effect estimates for all covariates, fire period during each trimester individually vs. all trimesters outside fire period (using cosinor approach rather than seasonal indicator variables).

	Effect estimate (change, in g)	95% CI
Exposure		
All trimesters outside fire period	(ref)	
Fire period during first trimester	-3.2	(-5.2, -1.1)
Fire period during second trimester	-11.6	(-14.0, -9.1)
Fire period during third trimester	-6.4	(-8.8, -3.9)
Fetal sex		
Male	(ref)	
Female	-118.9	(-119.9, -118.0)
Gestational age, weeks		
37	(ref)	
38	143.3	(140.7, 145.9)
39	273.4	(271.0, 275.7)
40	368.9	(366.5, 371.2)
41	441.9	(439.6, 444.3)
42	460.0	(457.4, 462.7)
Parity		
1	(ref)	
2	90.5	(89.4, 91.7)
3 or more	131.7	(130.5, 133.0)
Maternal age, years		
Less than 18	(ref)	
18 to 34	46.4	(43.5, 49.3)
35 to 50	71.8	(68.7, 74.9)
Maternal education		
Less than high school	-19.3	(-20.6, -18.1)
Completed h.s. or equivalent	(ref)	
1 to 3 years postsecondary	23.6	(22.2, 25.1)
4 or more years postsecondary	35.3	(33.8, 36.8)
Maternal race/ethnicity		
Hispanic	-42.0	(-43.4, -40.6)
Non-Hispanic White	(ref)	
Non-Hispanic Black	-175.9	(-177.7, -174.2)
Non-Hispanic Asian	-166.8	(-169.0, -164.6)
Non-Hispanic Multi/Other/Unknown	-31.3	(-39.8, -22.7)
Seasonality (by date of conception		
Peak-to-peak amplitude	11.6	(7.7, 15.5)
Acrophase (date of maximum birthweight)	Aug 4th	(Jul 29th, Aug 7th)
Linear time trend		
Per year	-6.8	(-7.2, -6.5)

Supplemental Material, Table S3. Linear model results for birth weight, in grams, showing effect estimates for all covariates, fire period during any trimester vs. all trimesters outside fire period, stratified by proximity to monitors with highest PM measures during fire event.

	Proximal to monitors with average PM >=40µg/m^3 during fire period		Proximal to monitors with average PM <40µg/m^3 during fire period	
	Effect estimate (change, in g)	**95% CI**	**Effect estimate (change, in g)**	**95% CI**
Exposure				
All trimesters outside fire period	(ref)		(ref)	
Fire period during any trimester	-6.6	(-11.0, -2.2)	-5.9	(-9.2, -2.6)
Fetal sex				
Male	(ref)		(ref)	
Female	-118.2	(-121.3, -115.1)	-119.4	(-121.7, -117.1)
Gestational age, weeks				
37	(ref)		(ref)	
38	149.4	(141.0, 157.89)	139.9	(133.5, 146.3)
39	273.5	(265.8, 281.3)	273.3	(267.5, 279.2)
40	367.1	(359.5, 374.7)	369.7	(363.9, 375.4)
41	436.0	(428.2, 443.8)	445.1	(439.2, 450.9)
42	448.4	(439.7, 457.0)	466.5	(460.0, 473.1)
Parity				
1	(ref)		(ref)	
2	88.5	(84.7, 92.2)	91.8	(89.0, 94.6)
3 or more	126.6	(112.6, 130.7)	134.9	(131.8, 138.0)
Maternal age, years				
Less than 18	(ref)		(ref)	
18 to 34	48.0	(38.5, 57.5)	45.4	(38.4, 52.5)
35 to 50	72.1	(61.8, 82.4)	70.7	(63.1, 78.4)
Maternal education				
Less than high school	-14.5	(-18.7, -10.3)	-22.4	(-25.6, -19.3)
Completed h.s. or equivalent	(ref)		(ref)	
1 to 3 years postsecondary	25.8	(21.3, 30.3)	22.3	(18.7, 26.0)
4 or more years postsecondary	34.8	(30.0, 39.6)	33.8	(30.0, 37.5)
Maternal race/ethnicity				
Hispanic	-30.0	(-34.1, -25.9)	-52.0	(-55.5, -48.4)
Non-Hispanic White	(ref)		(ref)	
Non-Hispanic Black	-167.4	(-173.3, -161.6)	-184.0	(-188.2, -179.8)
Non-Hispanic Asian	-159.2	(-166.8, -151.7)	-175.2	(-180.6, -169.8)
Non-Hispanic Multi/Other/Unknown	7.1	(-19.5, 33.7)	-57.7	(-79.2, -36.3)
Season of conception				
January–March	(ref)		(ref)	
April–June	3.7	(-0.8, 8.2)	3.2	(-0.2, 6.6)
July–September	11.7	(7.2, 16.1)	12.9	(9.5, 16.3)
October–December	-0.8	(-5.1, 3.5)	5.2	(2.0, 8.5)
Linear time trend				
Per year	-7.1	(-8.2, -6.0)	-6.8	(-7.6, -5.9)